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Gas temperature measurements in a microcathode sustained discharge in oxygen V. PUECH, J.F. LAGRANGE, N. SADEGHI, M. TOUZEAU, G. BAUVILLE, B. LACOUR, CNRS, LSP (GRENOBLE) TEAM, LPGP (ORSAY) TEAM — Microcathode sustained discharges (MCSD) produced between a microhollow cathode discharge (MHCD) and a third electrode offer the possibility to produce high density plasmas at low E/N values. Such discharges in oxygen could be attractive for efficient production of singlet O_2 if the gas temperature remains low. The temperature of a discharge in oxygen at 50 Torr and for currents up to 2 mA and E/N of 25 Td was measured through a spectroscopic investigation of the plasma emission. The spatial distribution of the $O_2(b^1\Sigma)$ and O(5p) was measured. These species have a very different behaviour: O(5p) is mainly produced inside the hole of the 0.2 mm diameter MHCD and its density decreases by two orders of magnitude over a distance of 3 mm. On the other hand, the $O_2(b^1\Sigma)$ production by the MHCD is very low, and this state is mainly produced in the MCSD, with a smooth density gradient in the interelectrode gap. The gas temperature was determined in the MCSD from the high resolution spectra of the atmospheric band at 760 nm, while the gas temperature inside the hole of the MHCD was measured through the rotational spectra of the 337 nm 2^{nd} positive band of nitrogen, introduced at low concentration in the discharge. In our experimental conditions, the gas temperature in the MHCD is lower than 650 K and less than 400 K in the MCSD.

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